



## Flow of Cheap Hydroelectricity Slows in Parched West

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As rivers and reservoirs shrink across the parched West, cheap sources of water-generated electricity are starting to dry up.

Historically low flows on the McKenzie River that snakes west of Oregon's snow-starved Cascades, for example, forced the closure of a hydroelectric generation turbine at the Trail Bridge dam in early July. Two more hydropower facilities downstream of the dam are likely to meet a similar fate in the coming weeks.

"We've done this before, but we usually don't have to do it until August," said Joe Harwood, a spokesman for the [Eugene Water and Electric Board](#). "Like everywhere else in the Northwest, the lack of snowpack essentially has accelerated the water volume in the rivers. We saw in June what we usually see in mid to late August."

A similar scenario is playing out in California, which is in its fourth year of a severe drought. Total hydroelectric generation dropped 60 percent between the wet year of 2011 and 2014, according to [data from the California Energy Commission](#). Hydro typically accounts for between 14 and 19 percent of California's total power mix. In recent years, it has dipped below 8 percent.

To help make up for California's loss of hydro as well as the 2012 shutdown of a nuclear power plant, natural gas generation increased 33 percent between 2011 and 2014.

"Natural gas is the fuel used most often to respond to electricity increases or decreases, so one would expect more gas usage when it is dry and less when it is wet," [Robert B. Weisenmiller](#), chair of the California Energy Commission, said in emailed comments. But, he said, there has also been a rise in power generated from wind and solar, allowing utilities to rely less on natural gas to fill the void. Solar generation alone increased to 10,365 gigawatt hours in 2014 from 1,097 gigawatt hours in 2011.

## Imperfect replacement

Wind and solar, however, are variable, which means they are an imperfect replacement for hydroelectricity, said [Jeffery Dagle](#), an expert on the integration of renewables at the Department of Energy's Pacific Northwest National Laboratory in Richland, Washington.

"The nice thing about hydro is that you can store it up and dispatch it, to draw it when you need it," he said.

In addition, hydroelectric generation can be ramped up and down quickly and efficiently to meet shifts in demand throughout the day. "You are just changing the setting of the gate for the turbine," Dagle said.

Natural gas-fired power plants -- known as peakers -- are the closest approximation to hydro and are thus the go-to supplement, said Christopher Namovicz, a renewables analyst with the Washington-based [U.S. Energy Information Administration](#). But, "every kilowatt hour you can generate from a wind plant or a solar plant is one that you don't have to burn gas for or you don't have to burn water for, so [wind and solar] can potentially help keep more water behind the dam, so to speak," he said.

## Higher rates, emissions

Electricity from natural gas, wind and solar is also more expensive than hydro, Namovicz said. Any utility that supplements a dip in hydro with alternatives faces higher operating costs.

"But how that passes through to the ratepayers is very complicated and you wouldn't necessarily expect to see any kind of immediate impact," he said.

The turbine shutoff at the Trail Bridge dam on the McKenzie River in Oregon has a 5-megawatt capacity, a blip in the Eugene Water and Electric Board's daily load of 275 megawatts.

"The effect we are going to see is maybe a slight drop in surplus power sales revenue," Harwood said.

"But there has been so much wind generation added in the Columbia River basin in the last 10 years that as a region we are very long on power."

The picture is less rosy at the [Sacramento Municipal Utility District](#) in California, which this April hiked rates 1.3 percent to cover an anticipated \$20 million bill for purchases of power to supplement the loss of hydro.

"Usually we get anywhere from 20 to 25 percent from our hydro for our portfolio and we've ended up more in the 8 to 10 percent coming from hydro this year," said Scott Martin, the utility's director of resource management.

The California-wide economic impact from the dip in hydro during the three years ending in October 2014 was approximately \$1.4 billion, according to a [recent analysis by the Pacific Institute](#), an Oakland-based environmental think tank. What's more, the increased use of natural gas resulted in an 8 percent rise in the greenhouse gas carbon dioxide from the state's power sector.

"The good news for people who care about renewables," said Peter Gleick, the institute's president and co-founder, "is that wind and solar continue to grow really fast; we are expanding wind and solar capacity at a remarkable rate. But whatever you don't build in terms of other renewables, we'll make up with natural gas."